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Two New Species of *Dipogon* (*Deuteragenia*) (Insecta: Hymenoptera: Pompilidae) from Subtropical Islands of Japan

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Two new species of the pompilid wasp genus *Dipogon* occurring in the subtropical islands of Japan are described: *Dipogon* (*Deuteragenia*) *amamiensis* from Amami-Oshima in the northern Ryukyu Islands, and *Dipogon* (*Deuteragenia*) *ogasawarensis* from Haha-jima in the Ogasawara Islands (Bonin Islands). A brief discussion of the distribution of the Japanese species of *Dipogon* (*Deuteragenia*) is provided.

Key Words: systematics, Hymenoptera, Pompilidae, Pepsinae, *Dipogon* (*Deuteragenia*), new species, Japan.

Introduction

The spider-wasp genus *Dipogon* Fox, 1897 is one of the most distinctive genera of the pompilid subfamily Pepsinae. Members of this genus have several unique morphological features, such as a fascicle of very long, curved bristles on the maxillary cardo and an upwardly curved sting in the female (Shimizu and Ishikawa 2002a). These wasps utilize pre-existing holes in wood, hollow stems, walls, and other cavities for their nest cells, which are closed with various compacted materials.

Deuteragenia Šusterka, 1912 is the largest among the subgenera of *Dipogon* and its species have the most generalized habitus in the genus. They are widely distributed throughout the world except in the Australian region. Seven species are known to occur in Western Europe (Wahis 1986, 2005), and 14 species in North and Central America (Townes 1957; Evans 1974; Krombein 1979; Poole 1996). Shimizu and Ishikawa (2002a, 2002b, 2003) revised the Japanese species of *Deuteragenia*. They treated 11 species, five of which were new, and tentatively divided them into five species-groups, i.e., the groups of *Dipogon* (*Deuteragenia*) *conspersus* (Pérez, 1905), *D. (D.) vechti* Day, 1979, *D. (D.) granulifrons* Shimizu and Ishikawa, 2002, *D. (D.) immarginatus* (Gussakovskij, 1933), and *D. (D.) bifasciatus* (Geoffroy, 1785).

In my recent examination of material deposited in the Department of Zoology, National Science Museum, Tokyo, and the Laboratory of Systematic Zoology, Tokyo Metropolitan University, Tokyo, I discovered two females referable to two separate and undescribed species of the subgenus *Deuteragenia*. One species is from the island of Amami-Oshima in the northern Ryukyu Islands, and the other species is from Haha-jima, one of the Ogasawara Islands (Bonin Islands). This paper provides formal descriptions of these two new species and a summary of the

distribution of the Japanese species of *Deuteragenia*.

Materials and Methods

The terminology of the wing veins and cells follows Day (1988). The following morphological terms and abbreviations are used in the descriptions: antennocular line, anterior margin of frons in dorsal view; maxillary beard, a fascicle of long, stout, curved setae on the maxillary cardo; LID, lower interocular distance; MID, middle interocular distance; OOL, ocello-ocular line; POL, postocellar line; SMC, submarginal cell of forewing; UID, upper interocular distance. Specimen depositories are abbreviated as follows: NSMT, Department of Zoology, National Science Museum, Tokyo; TMUZ, Laboratory of Systematic Zoology, Department of Biological Sciences, Tokyo Metropolitan University, Tokyo.

Systematics

Dipogon (Deuteragenia) amamiensis sp. nov.

[Japanese name: Amami-hige-kumobachi]

(Figs 1–13)

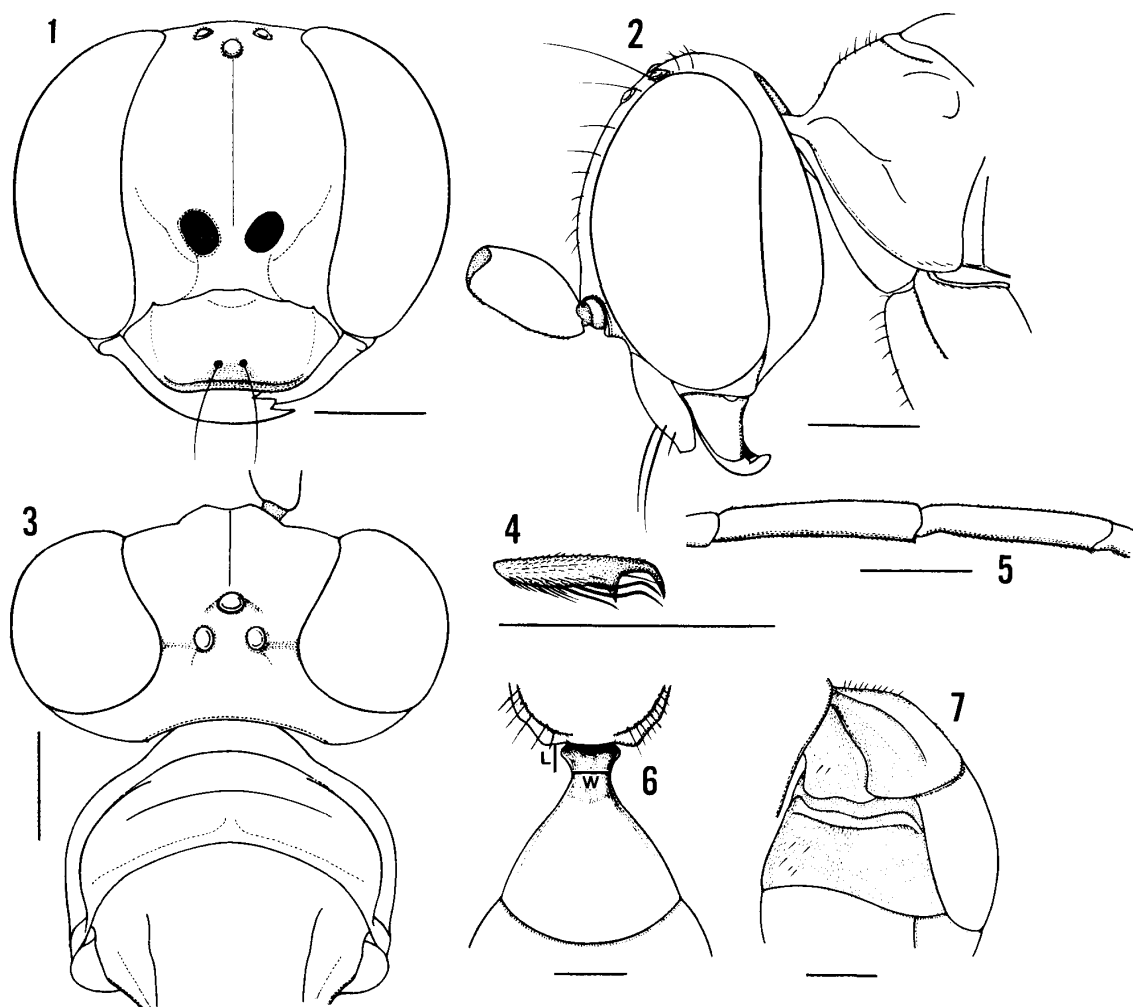
Type material. Holotype: ♀, Shinmura, Sumiyo Village, Amami-Oshima Island, northern Ryukyu Islands, 28 August 1958, S. Uéno leg., TMUZ-2006-001.

Diagnosis. This species is distinguished from other species of the subgenus *Deuteragenia* occurring in Japan and adjacent regions by the following characteristics: head and mesosoma matte; apical rim of clypeus scarcely depressed but set off from main part of clypeus by absence of both punctures and pubescence (Fig. 12); apical margin of clypeus almost straight without median emargination; flagellomere I very slender (Fig. 5), much longer than UID; vertex and upper frons with several erect setae, these being less than $0.5\times$ as long as longest seta by inner orbit on each side of vertex (Fig. 2); frons above antennal sockets with fine and dense punctures, spaces between punctures being narrower than diameter of each puncture (Fig. 11); POL slightly greater than OOL; propodeum long and gently convex in profile (Fig. 8), minutely and reticulately rugulose with strong transverse rugae posterolaterally (Fig. 13) and several suberect white setae, these being much shorter than those on metasomal tergum VI; metasomal tergum I distinctly petiolate (Fig. 6); sternum II with sharply impressed line immediately behind transverse groove (Fig. 7); and forewing with ill-defined, subapical white area (Fig. 9).

Description. *Holotype female.* Body length 7.9 mm; forewing length 6.8 mm.

Body black. Following areas ferruginous: pronotum laterally, metasomal terga laterally and posteriorly, metasomal sterna anteriorly and posteriorly, and apical half of mandible. Antenna and legs brownish black, possibly caused by secondary discoloration; palpi brown; maxillary beard dark brown. Tarsal claws yellowish brown. Wing hyaline; forewing broadly and distinctly bifasciate, feebly and narrowly infusate apically (Fig. 9); hindwing feebly but broadly infusate apically.

Head and mesosoma finely and densely punctate, except for disc of metanotum, metapleuron, and propodeum, these areas being minutely reticulate-rugulose (propodeum without median smooth area); metanotum laterally exhibiting several

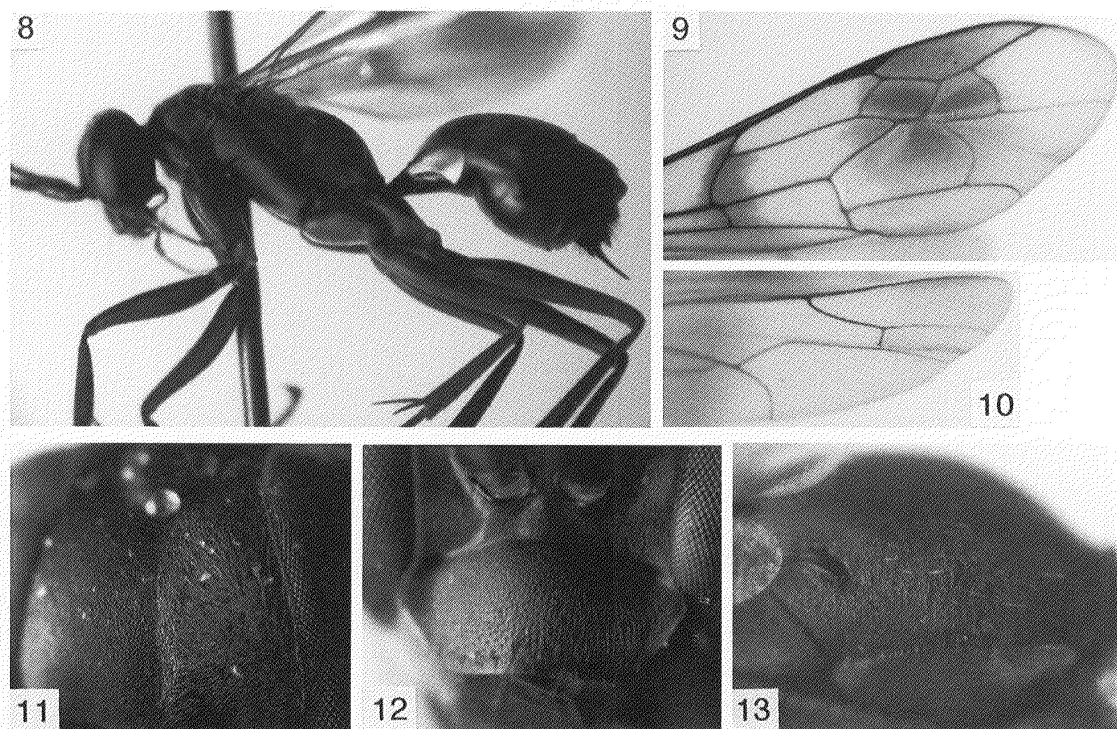


Figs 1–7. *Dipogon (Deuteragenia) amamiensis* sp. nov., holotype female. 1, Head, frontal view; 2, 3, head and pronotum, lateral (2) and dorsal (3) views; 4, left mesotarsal claw, outer view; 5, right flagellomere I and II, dorsal view; 6, metasomal tergum I, dorsal view (L, length of petiole between base and greatest constriction; W, minimum width of petiole); 7, metasomal terga I and II, ventrolateral view. Scales: 0.5 mm.

strong striae; metapostnotum with few transverse striae. Metasoma weakly polished with very fine, dense punctures.

Body with very short, decumbent, white pubescence conferring a pruinose appearance. Body not setose; propodeum posterolaterally, propleuron, and procoxa with moderately long, white setae; metasomal terga V–VI and sterna IV–VI with long, stiff, dark brown setae; setae on remainder of body and legs very short and sparse.

Head in frontal view $1.2\times$ as wide as long (Fig. 1). Vertex feebly convex between eye tops. Supra-antennal area of frons slightly raised above level of clypeus in lateral view (Fig. 2); median line barely impressed from supra-antennal area to anterior ocellus. Antennocular line weakly inclined from antennal base toward eye (Fig. 3). Inner orbits arcuate, much more strongly convergent above than



Figs 8–13. *Dipogon (Deuteragenia) amamiensis* sp. nov., holotype female. 8, Body and legs, lateral view; 9, forewing; 10, hind wing; 11, upper frons, frontal view; 12, clypeus, frontal view; 13, propodeum, lateral view.

below; UID:MID:LID = 6.0:10:8.8. MID $0.51\times$ head width. Ocelli forming approximately equilateral triangle; ocellar area weakly raised. Eye in frontal view broadest slightly below middle. POL:OOL = 1:0.85. Clypeus much wider than LID (Fig. 1), $2.1\times$ as wide as long, gently convex transversely and lengthwise except for lateral flattened area, without preapical ridge (Fig. 12); preapical setiferous pores strong; apical rim impunctate and alutaceous. Malar space very short and linear. Genae in dorsal view strongly receding and thin (Fig. 3), in profile $0.3\times$ eye width (Fig. 2). Flagellomere I $5.5\times$ as long as wide, $1.5\times$ UID; flagellomeres I and II in length ratio of 10:8.6.

Pronotum in dorsal view comparatively long with lateral margins convergent posteriorly, so shoulder slightly swollen (Fig. 3); dorsum gently sloped (Fig. 2); posterior portion feebly depressed; posterior margin arcuate. Mesoscutum with posterolateral margin distinctly reflexed. Scutellum with disc convex, slightly raised above level of mesoscutum, distinctly narrowed posteriorly. Metapostnotum strongly declivous medially, triangularly emarginate posteriorly, $0.2\times$ as long as metanotum at midline. Propodeum $1.2\times$ as long as broad with stigmal furrow both anterior and posterior to spiracle; lateral margins gently convergent posteriorly; median groove vestigial.

Metasomal tergum I with part of petiole anterior to constriction shorter than wide (Fig. 6). Transverse groove on sternum II slightly incurved medially (Fig. 7).

Fore- and hindwings as shown in Figs 9 and 10, respectively. SMC2 rhomboid, receiving crossvein 1m-cu at basal 0.63. SMC3 $1.3\times$ as long as SMC2 on vein M, nar-

rowed on vein Rs by $0.42\times$ its length on vein M, receiving crossvein 2m-cu at basal 0.26. Hindwing crossvein rs-m scarcely curved, nearly perpendicular to vein M (Fig. 10). Jugal lobe $0.34\times$ as long as subbasal (submedian) cell.

Profemur almost as thick as mesofemur. Mesotibia with several short spines dorsally and exteriorly. Metatibia less spinose than mesotibia, with minute spine dorsally and several ones exteriorly; apical outer margin with six short spines. Longer spur of metatibia $0.49\times$ as long as tarsomere I. Tarsal claws each with stout, vertical tooth (Fig. 4).

Etymology. Named after the type locality, Amami-Oshima Island.

***Dipogon (Deuteragenia) ogasawarensis* sp. nov.**

[Japanese name: Ogasawara-hige-kumobachi]

(Figs 14–25)

Type material. Holotype: ♀, Mt. Chibusa, Haha-jima Island, Ogasawara Islands, 21 June 1976, S. Shinonaga leg., NSMT-I-Hym 26441.

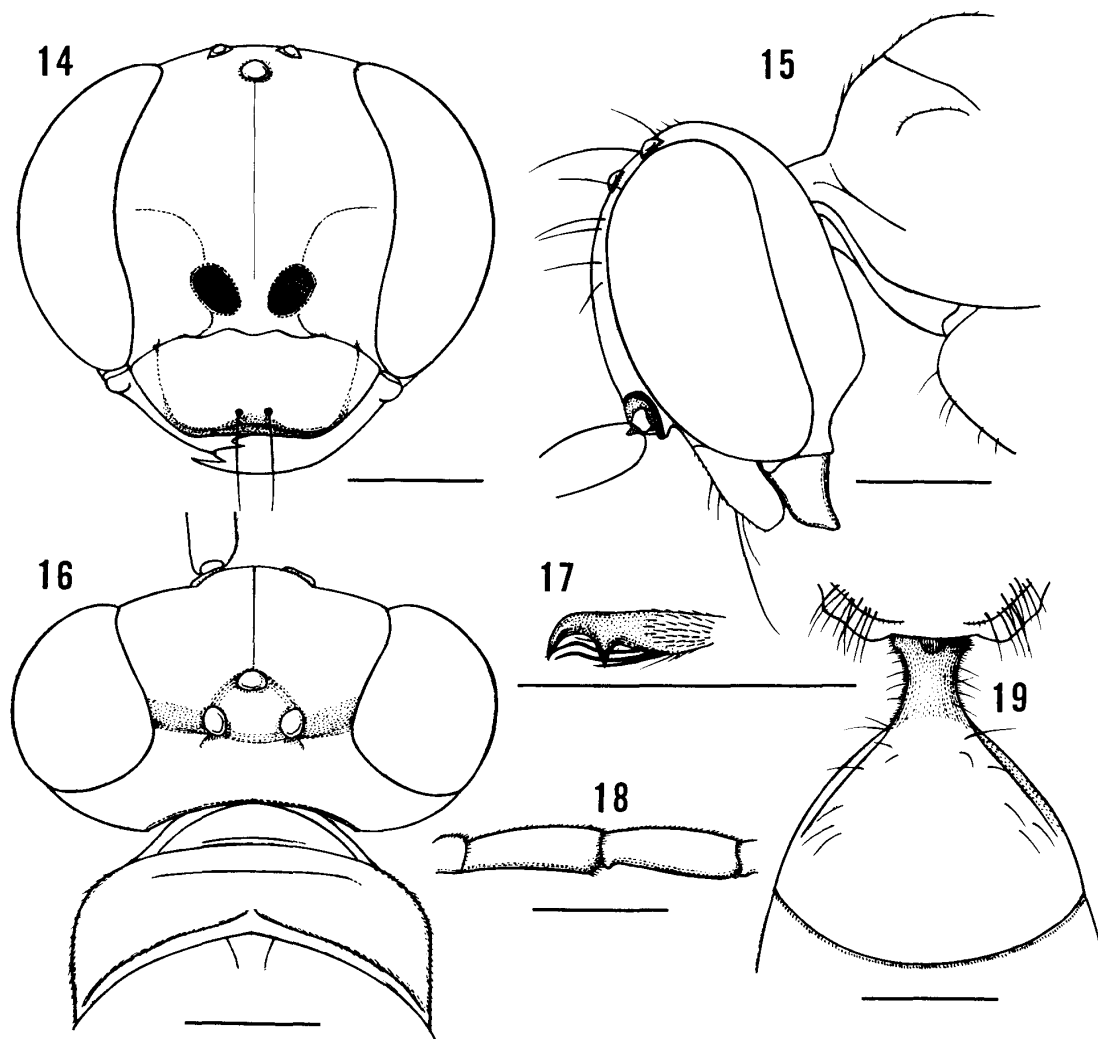
Diagnosis. This species is distinguished from other species of the subgenus *Deuteragenia* occurring in Japan and adjacent regions by the following characteristics: body polished; apical rim of clypeus barely depressed, impunctate and alutaceous; apical margin of clypeus almost straight without median emargination (Fig. 24); flagellomere I not elongate (Fig. 18), much shorter than UID; vertex and upper frons with several erect setae, some being more than $0.5\times$ as long as longest seta by inner orbit on each side of vertex (Fig. 15); frons above antennal sockets with fine, dense punctures, spaces between punctures on upper frons being usually broader than diameter of each puncture (Fig. 23); POL greater than OOL; propodeum short and spherically convex in profile (Fig. 20), propodeum except median portion finely and densely punctate, and transversely rugulose posterolaterally (Fig. 25) with several suberect white setae, these being much shorter than those on metasomal tergum VI; metasomal tergum I distinctly petiolate (Fig. 19); sternum II with sharply impressed line immediately behind transverse groove as in *D. (D.) amamiensis* (Fig. 7); forewing narrowly and obscurely bifasciate, without subapical white area (Fig. 21).

Description. *Holotype female.* Body length 6.6 mm; forewing length 6.0 mm.

Body and legs black; apical third of mandible, side of metasomal tergum I, and apices of tarsomeres ferruginous; palpi brown; maxillary beard golden; apical half of tarsal claws yellowish brown. Wings yellowish brown and transparent. Hindwing not infusate apically.

Head and mesosoma moderately polished, metasoma more strongly polished. Head, mesoscutum, mesopleuron, and lower metapleuron finely and densely punctate; scutellum and disc of metanotum more weakly and sparsely punctate than head; metanotum with several strong striae laterally; metapostnotum with few fine striae anteriorly; upper metapleuron with fine, oblique striae and small punctures between them. Propodeum with irregularly-spaced, dense punctures, these weaker and sparser anteriorly; median area narrowly impunctate and shining. Metasoma with minute, dense punctures, these weaker and sparser on tergum I than on tergum II.

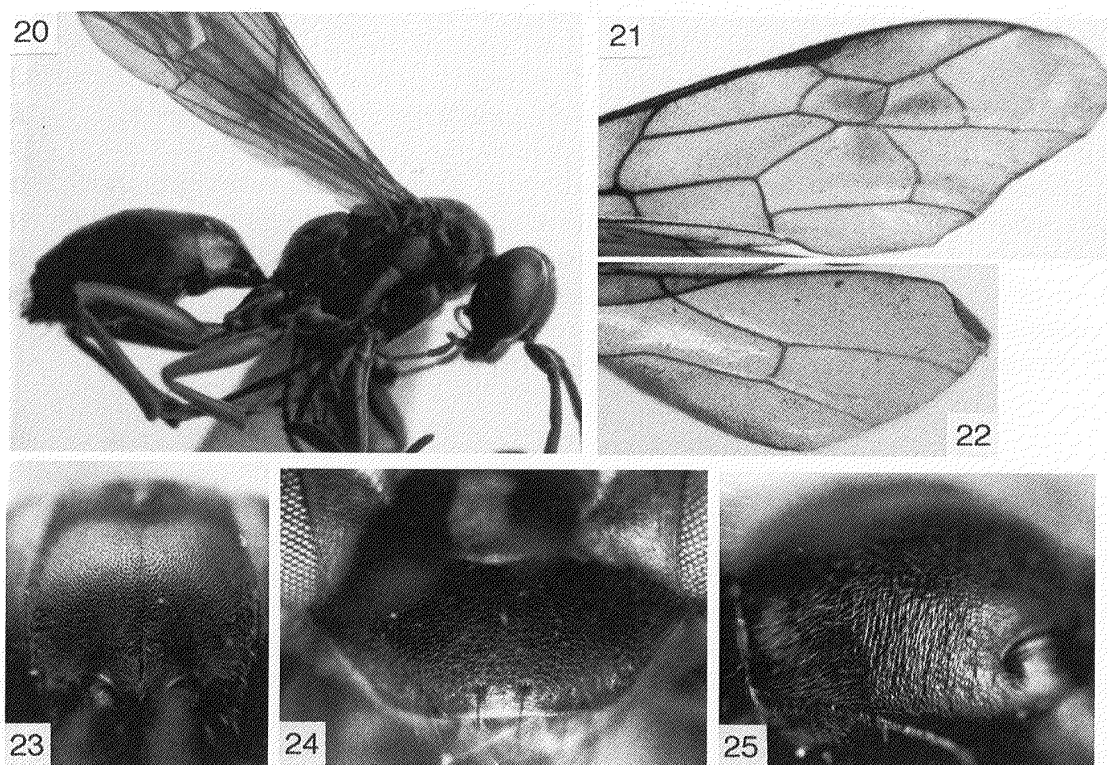
Body and legs with short, pale brown to white pubescence longer on lower



Figs 14–19. *Dipogon (Deuteragenia) ogasawarensis* sp. nov., holotype female. 14, Head, frontal view; 15, 16, head and pronotum, lateral (15) and dorsal (16) views; 17, right metatarsal claw, outer view; 18, right flagellomere I and II, dorsal view; 19, metasomal tergum I, dorsal view. Scales: 0.5 mm.

frons, clypeus, basal half of mandible, lower gena, propleuron, lower mesopleuron, posterolateral portion of propodeum, and coxae. Gena and posterolateral portion of propodeum densely set with long, erect, white setae; propleuron, procoxa, and metasomal tergum I with comparatively dense, white setae laterally, shorter than those on gena and propodeum. Femora with very short, sparse, white setae. Metasomal terga IV–VI, posterior half of metasomal sternum II, and following sterna with long, stiff, white to brown setae becoming denser apicad.

Head in frontal view $1.2\times$ as wide as long (Fig. 14). Vertex gently convex between eye tops. Supra-antennal area of frons moderately raised above level of clypeus in lateral view (Fig. 15); median line very fine from supra-antennal area to anterior ocellus. Antennocular line distinctly inclined from antennal base toward eye (Fig. 16). Inner orbits arcuate, more strongly convergent above than below;



Figs 20–25. *Dipogon (Deuteragenia) ogasawarensis* sp. nov., holotype female. 20, Body and legs, lateral view; 21, forewing; 22, hind wing; 23, upper frons, frontal view; 24, clypeus, frontal view; 25, propodeum, lateral view.

UID: MID: LID = 6.5: 10: 8.5. MID $0.57\times$ head width. Ocelli forming acute-angled triangle broader than equilateral one; ocellar area moderately raised. Eye in frontal view broadest at middle. POL: OOL = 1: 0.77. Clypeus slightly wider than LID (Fig. 14), $2.2\times$ as wide as long, gently convex transversely and lengthwise except for lateral flattened area, without preapical ridge (Fig. 24); preapical pores strong. Malar space very short and linear. Gena in dorsal view more gently receding and thicker than in *D. (D.) amamiensis* (compare Fig. 16 and Fig. 3), in profile $0.4\times$ eye width (Fig. 15). Flagellomere I $3.3\times$ as long as wide, $0.79\times$ UID, nearly as long as flagellomere II.

Pronotum in dorsal view comparatively short with lateral margins subparallel posteriorly, so shoulder scarcely swollen (Fig. 16); dorsum short and steeply sloped, declivity nearly perpendicular (Fig. 15); posterior portion feebly depressed; posterior margin subangulate medially. Mesoscutum with posterolateral margin narrowly reflexed. Scutellum with disc scarcely convex, barely raised above level of mesoscutum, gently narrowed posteriorly. Metapostnotum deeply sunken medially between metanotum and propodeum, arcuately emarginate posteriorly, less than $0.1\times$ as long as metanotum along midline. Propodeum $0.94\times$ as long as broad, with stigmal furrow only anterior to spiracle; lateral margins strongly convergent posteriorly; median groove very shallowly impressed.

Metasomal tergum I with part of petiole anterior to constriction shorter than wide (Fig. 19). Transverse groove on sternum II almost straight.

Fore- and hindwing as shown in Figs 21 and 22, respectively. SMC2 receiving crossvein 1m-cu at basal 0.59. SMC3 $1.3\times$ as long as SMC2 on vein M, narrowed on vein Rs by $0.47\times$ its length on vein M, receiving crossvein 2m-cu at basal 0.10. Hindwing crossvein rs-m slightly curved, somewhat oblique to vein M (Fig. 22). Jugal lobe $0.36\times$ as long as subbasal cell.

Profemur slightly thicker than mesofemur. Mesotibia with several short, stout spines dorsally and exteriorly. Metatibia with 2 or 3 minute spines exteriorly and several short, suberect, white setae dorsally; apical outer margin with 3 (right tibia) or 4 (left tibia) short spines. Longer spur of metatibia $0.55\times$ as long as tarsomere I. Tarsal claws each with stout, vertical tooth (Fig. 17).

Etymology. Named after the type locality, the Ogasawara Islands.

Discussion

The two new species described in this study are morphologically similar to *D. (D.) immarginatus* occurring in the Far East, but they are easily distinguished by the characters shown in Table 1.

Because our knowledge of the pompilid fauna of Korea and China is still fragmentary, any discussion of East Asian biogeography of *Dipogon* must be considered preliminary; nevertheless, I would like to take this opportunity to provide some remarks on the distribution of the subgenus *Deuteragenia*.

Distributional records on the Japanese species are summarized in Table 2. Their distributional patterns fall into three categories as follows:

(1) Palaearctic (from Europe through Central Asia and the Russian Far East to Japan): *D. (D.) vechti* and *D. (D.) bifasciatus*.

Table 1. Comparison of differential characters among three similar species of *Dipogon* (*Deuteragenia*).

<i>D. (D.) amamiensis</i> sp. nov.	<i>D. (D.) ogasawarensis</i> sp. nov.	<i>D. (D.) immarginatus</i>
1. Anterior margin of clypeus without median emargination	Anterior margin of clypeus without median emargination	Anterior margin of clypeus with median emargination
2. Clypeus much wider than LID	Clypeus slightly wider than LID	Clypeus much wider than LID
3. Flagellomere I more than $5\times$ as long as wide, much longer than UID	Flagellomere I less than $4\times$ as long as wide, much shorter than UID	Flagellomere I less than $4\times$ as long as wide, much shorter than UID
4. $POL > OOL$	$POL > OOL$	$POL \leq OOL$
5. Propodeum minutely and reticulately rugulose with transverse rugae posterolaterally	Propodeum finely punctate with transverse rugae posterolaterally	Propodeum finely and densely punctate without transverse rugae
6. Forewing hyaline with well defined dark fascia	Forewing transparent, yellowish brown, fasciae not well defined	Forewing hyaline with well defined dark fasciae

Abbreviations: LID, lower interocular distance; OOL, ocello-ocular line; POL, postocellar line; UID, upper interocular distance.

Table 2. Distribution of the East Asian and Philippine species of *Dipogon* (*Deuteragenia*).

	Europe	Central Asia	Korea	Russian Far East	Hokkaido	Honshu	Shikoku	Kyushu	Amami Is.	Ogasawara Is.	Taiwan	Philippines	References
<i>Dipogon</i> (<i>Deuteragenia</i>) <i>antropovi</i> Lelej, 1995				*								11, 12	
<i>D. (D.) albiclypeatus</i> Lelej, 1986				*								9, 11	
<i>D. (D.) conspersus</i> (Pérez, 1905)			*?		*?	*	*	*				10, 12, 13	
<i>D. (D.) sperconsus</i> Shimizu and Ishikawa, 2002					*	*	*	*				13, 16	
<i>D. (D.) inconspersus</i> Shimizu and Ishikawa, 2002						*	*					13	
<i>D. (D.) romankovae</i> Lelej, 1986				*	*	*						9, 11, 14	
<i>D. (D.) vechti</i> Day, 1979	*	*		*	*	*						2, 4, 5, 6, 9, 11, 14	
<i>D. (D.) albitrrix</i> Shimizu and Ishikawa, 2002					*	*		*				14	
<i>D. (D.) granulifrons</i> Shimizu and Ishikawa, 2002					*	*						14	
<i>D. (D.) carychroceræus</i> Shimizu and Ishikawa, 2002					*	*						14	
<i>D. (D.) immarginatus</i> (Gussakovskij, 1933)				*	*	*	*	*				9, 11, 12, 15, 16	
<i>D. (D.) bifasciatus</i> (Geoffroy, 1785)	*	*	*	*	*	*	*	*				2, 4, 5, 6, 9, 10, 11, 12, 15, 16	
<i>D. (D.) nipponicus</i> (Yasumatsu, 1939)				*	*	*	*					9, 11, 15, 16	
<i>D. (D.) amamiensis</i> sp. nov.									*			Present study	
<i>D. (D.) ogasawarensis</i> sp. nov.										*		Present study	
<i>D. (D.) immaculatus</i> Ishikawa, 1965										*	*	3	
<i>D. (D.) taiwanus</i> Ishikawa, 1965										*	*	3	
<i>D. (D.) pempuchianus</i> Tsuneki, 1989										*	*	8	
<i>D. (D.) fenchihuensis</i> Tsuneki, 1989										*	*	8	
<i>D. (D.) thias</i> Banks, 1934											*	1	
<i>D. (D.) philippinensis</i> Tsuneki, 1988											*	7	

References: 1, Banks (1934); 2, Wolf (1964); 3, Ishikawa (1965); 4, Wolf (1972); 5, Wahis (1972); 6, Day (1979); 7, Tsuneki (1988); 8, Tsuneki (1989); 9, Lelej (1986); 10, Lelej *et al.* (1994); 11, Lelej (1995); 12, Lelej (2000); 13, Shimizu and Ishikawa (2002a); 14, Shimizu and Ishikawa (2002b); 15, Shimizu and Ishikawa (2003); 16, Haneda and Yamamoto (2005).

In *D. (D.) bifasciatus*, specimens from the Far East (Russian Far East and Japan) and those from Europe differ in the structure of the male antenna (Shimizu and Ishikawa 2003, figs 42–44): flagellomeres III–XI are serrate below in the former, but either are not, or are but scarcely serrate, in the latter (see also Wolf 1964 and Wahis 1972, as *D. (D.) hircanum* (Fabricius, 1798)). However, these specimens are hardly distinguishable in other characters, including the structure of the male genitalia and subgenital plate.

(2) Far Eastern (Russian Far East and the Japanese Archipelago): *D. (D.) romankovae* Lelej, 1986, *D. (D.) immarginatus*, and *D. (D.) nipponicus* (Yasumatsu, 1939).

(3) Indigenous to the Japanese Archipelago: *D. (D.) conspersus*, *D. (D.) sperconsus* Shimizu and Ishikawa, 2002, *D. (D.) inconspersus* Shimizu and Ishikawa, 2002, *D. (D.) albithrix* Shimizu and Ishikawa, 2002, *D. (D.) granulifrons*, and *D. (D.) carychroceraeus* Shimizu and Ishikawa, 2002.

Lelej *et al.* (1994) recorded *D. (D.) conspersus* from Korea and Hokkaido; these records need to be confirmed, however, because *D. (D.) conspersus* is very similar to *D. (D.) sperconsus* and was not recognized as a distinct species prior to 2002. The latter species has been recorded in Hokkaido, Honshu, and Kyushu (Shimizu and Ishikawa 2002a). Although I examined 82 specimens of *D. (D.) conspersus* deposited at TMUZ, there were none from Hokkaido. I also examined 62 specimens of *Deutrogenia* that Mr K. Sayama collected in a suburb of Sapporo, Hokkaido, using trap nests. This series consisted of *D. (D.) sperconsus*, *D. (D.) romankovae*, *D. (D.) albithrix*, and *D. (D.) bifasciatus* but did not include individuals of *D. (D.) conspersus*. Consequently, it is possible that *D. (D.) sperconsus* rather than *D. (D.) conspersus* is distributed in Korea, as well as in Hokkaido.

Dipogon (Deutrogenia) amamiensis and *D. (D.) ogasawarensis* may be endemic to the Amami and Ogasawara Islands, respectively. Neither species matches the definition of any of the species-group presented by Shimizu and Ishikawa (2002a, 2002b, 2003). For recognition of the species-group, male morphological characters, especially structures of the subgenital plate and lateral hook of the metasomal sternum VI, are very important. Because male specimens have not been available for study for the two new species, it is difficult to discuss satisfactorily their taxonomic position. Based on female adult morphology, there is no evidence that they are closely related to each other. It is unclear whether or not they belong to the same species-group.

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